upmendexで作る多言語索引
Multilingual index processing by upmendex

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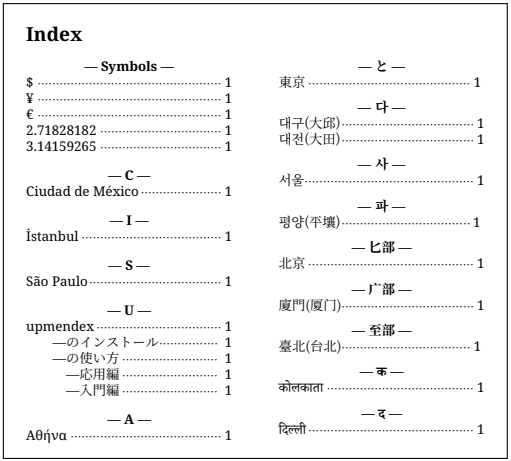
Overview

- Feature of **upmendex**
  — Multilingual index processor
- Localization
  - Latin, Cyrillic, Greek
  - CJK (Chinese, Japanese, Korean)
  - Devanagari, Thai
  - Arabic, Hebrew
- Multilingual environment
- Benchmark



Index

— **Symbols** —
$ 1
¥ 1
€ 1
2.71828182 1
3.14159265 1

— **C** —
Ciudad de México 1

— **I** —
İstanbul 1

— **S** —
São Paulo 1

— **U** —
upmendex 1
—のインストール 1
—の使い方 1
—応用編 1
—入門編 1

— **A** —
Αθήνα 1

— と —
東京 1

— 다 —
대구(大邱) 1
대전(大田) 1

— 사 —
서울 1

— 파 —
평양(平壤) 1

— 匕部 —
北京 1

— 亠部 —
廈門(厦门) 1

— 至部 —
臺北(台北) 1

— ক —
কোলকাতা 1

— द —
दिल्ली 1

Feature of upmendex (Ver. 1.06)

- Index processor
  - Upper compatible with **MakeIndex**/**Mendex**
  - Work with upLaTeX/LuaLaTeX/XeLaTeX
- Localization
  - Support 60 Languages / 12 Scripts
    - Latin (incl. non-English), Cyrillic, Greek
    - CJK (Chinese, Japanese, Korean)
    - Devanagari, Thai
    - Arabic, Hebrew
    - Symbol, Number
- Multilingualization
  - Unicode, UTF-8
  - ICU† (Collation, Case Conversion, Category Property)
  - Environment for babel/polyglossia

† ICU: International Components for Unicode

Language, Script, Locale

Language	Script / Index	ICU locale
English	Latin	root
Spanish	Latin	es
German	Latin	de
Turkish	Latin	tr
…		
Russian	Cyrillic	ru
Ukrainian	Cyrillic	uk
…		
Greek	Greek	el
Chinese	Hanzi / Pinyin	zh
	Hanzi / Stroke	zh-u-co-stroke
	Hanzi / Radical-Stroke	zh-u-co-unihan
	Hanzi / Zhuyin	zh-u-co-zhuyin
Japanese	Kana & Hanzi / Kana	ja
Korean	Hangul	ko

Language	Script / Index	ICU locale
Hindi	Devanagari	hi
Marathi	Devanagari	mr
…		
Thai	Thai	th
Persian	Arabic	fa
Arabic	Arabic	ar
…		
Hebrew	Hebrew	he
Yiddish	Hebrew	yi
Common	Symbol	
	Number	

upmendex supports 60 languages, 12 scripts & 95 locales.

Latin, Cyrillic, Greek

- Sorting (Collation) | ソート順
- Diacritical mark | ダイアクリティカルマーク
- Digraph/Trigraph | ダイグラフ/トライグラフ

German, Phonebook Sort Order

Collation Rule locale: de-u-co-phonebk

```
&AE<<ä<<<Ä
&OE<<ö<<<Ö
&UE<<ü<<<Ü
...
```

Style File *.ist locale: de-u-co-phonebk

```
icu_locale "de-u-co-phonebk"
```

German Inputs in *.tex

```
ad\index{ad}.
ae\index{ae}.
AE\index{AE}.
ä\index{ä}.
Ä\index{Ä}.
af\index{af}.
...
```

Index

— A —

a 1
A 1
ä 1
Ä 1
ad 1
AD 1
ae 1
AE 1
af 1
AF 1

default

Index

— A —

a 1
A 1
ad 1
AD 1
ae 1
AE 1
ä 1
Ä 1
af 1
AF 1

phonebook sort order

Lithuanian, Sort Order of Y

Collation Rule locale: lt

```
&I<<į<<<Į<<y<<<Y
...
```

Lithuanian Inputs in *.tex

```
i\index{i}.
I\index{I}.
į\index{į}.
Į\index{Į}.
y\index{y}.
Y\index{Y}.
...
```

Rodyklė

— H —
h 1
H 1

— I —
i 1
I 1
į 1
Į 1
y 1
Y 1

— J —
j 1
J 1

— X —
x 1

— Z —
z 1

Slovak, Diacritical Mark

Collation Rule locale: sk

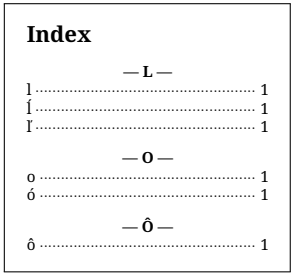
```
&O<ô<<<Ô
...
```

Collation Rule locale: sk-u-co-search

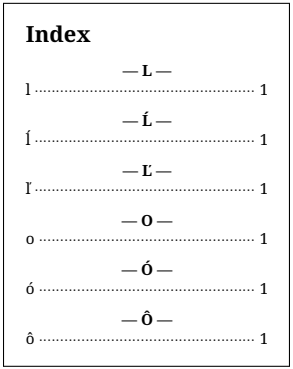
```
&L<Í<<<Ĺ<Ľ<<<ľ
&O<ó<<<Ô<ô<<<Ô
...
```

Slovak Inputs in *.tex

```
l\index{l}.
Í\index{Í}.
Ľ\index{Ľ}.
o\index{o}.
ó\index{ó}.
ô\index{ô}.
```



default



General-Purpose Search

Turkish, Dotless / Dotted I

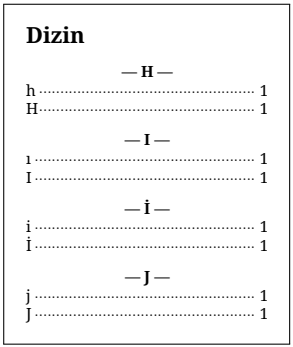
language	upper	lower
Turkish	İ	i
	I	ı
English	I	i

Collation Rule locale: tr

```
&[before 1]i<ı<<<I
&i<<<İ
...
```

Turkish Inputs in *.tex

```
h\index{h}.
H\index{H}.
i\index{i}.
ı\index{ı}.
I\index{I}.
İ\index{İ}.
j\index{j}.
J\index{J}.
...
```



Turkish

Hungarian, Digraphs and Trigraph

Collation Rule locale: hu

```
&C<cs<<<Cs<<<CS
&D<dz<<<Dz<<<DZ
&DZ<dzs<<<Dzs<<<DZS
...
```

Hungarian Inputs in *.tex

```
cr\index{cr}.
cs\index{cs}.
ct\index{ct}.
dy\index{dy}.
dz\index{dz}.
dzr\index{dzr}.
dzs\index{dzs}.
dzt\index{dzt}.
e\index{e}.
...
```

Tárgymutató

— C —
c 1
cr 1
ct 1

— Cs —
cs 1

— D —
dy 1

— Dz —
dz 1
dzr 1
dzt 1
dzz 1

— Dzs —
dzs 1

— E —
e 1

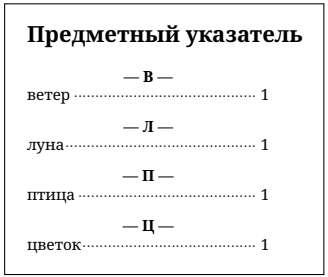
Cyrillic & Greek

Russian Inputs in *.tex

```
цветок\index{цветок}.
птица\index{птица}.
ветер\index{ветер}.
луна\index{луна}.
```

Greek Inputs in *.tex

```
λουλούδι\index{λουλούδι}.
πουλί\index{πουλί}.
άνεμος\index{άνεμος}.
φεγγάρι\index{φεγγάρι}.
```



Предметный указатель

— В —
ветер 1

— Л —
луна 1

— П —
птица 1

— Ц —
цветок 1

Russian, Cyrillic

Ευρετήριο

— Α —
άνεμος 1

— Λ —
λουλούδι 1

— Π —
πουλί 1

— Φ —
φεγγάρι 1

Greek

CJK (Chinese, Japanese, Korean)

- Chinese: 4 kinds of sort order | 中国語: 4種のソート順
- Japanese: Reading, Extended Kana
  | 日本語: 読み、仮名拡張
- Korean: composed/decomposed | 韓国語: 完成型・組合型

Chinese, Han Ideograph Sort Order

Style File *.ist locale: zh-u-co-unihan

```
%icu_locale "zh"
%icu_locale "zh-u-co-stroke"
icu_locale "zh-u-co-unihan"
%icu_locale "zh-u-co-zhuyin"
hanzi_head  "一部;丨部;丶部;丿部;乙部;亅部;二部;亠部;
...
```

Chinese Inputs in *.tex

```
花\index{花 (8, 艸, huā, ㄏㄨㄚ)}
鳥\index{鳥 (11, 鳥, niǎo, ㄋㄧㄠˇ)}
風\index{風 (9, 風, fēng, ㄈㄥ)}
月\index{月 (4, 月, yuè, ㄩㄝˋ)}
```

sort order		locale
Pinyin	拼音	zh
Stroke	筆畫數	zh-u-co-stroke
Radical-Stroke	部首筆畫數	zh-u-co-unihan
Zhuyin (Bopomofo)	注音符號	zh-u-co-zhuyin

Chinese, Han Ideograph Sort Order

Pinyin Sort Order 拼音 locale: zh

```
\centerline{\bfseries --- F ---}\par\nobreak
  \item 風 (9, 風, fēng, ㄈㄥ)\leaders\hbox{ }\hfill 1

  \indexspace

\centerline{\bfseries --- H ---}\par\nobreak
  \item 花 (8, 艸, huā, ㄏㄨㄚ)\leaders\hbox{ }\hfill 1
```

Radical-Stroke Sort Order 部首筆畫數 zh-u-co-unihan

```
\centerline{\bfseries --- 月部 ---}\par\nobreak
  \item 月 (4, 月, yuè, ㄩㄝˋ)\leaders\hbox{ }\hfill 1

  \indexspace

\centerline{\bfseries --- 艸部 ---}\par\nobreak
  \item 花 (8, 艸, huā, ㄏㄨㄚ)\leaders\hbox{ }\hfill 1
```

Stroke Sort Order 筆畫數 zh-u-co-stroke

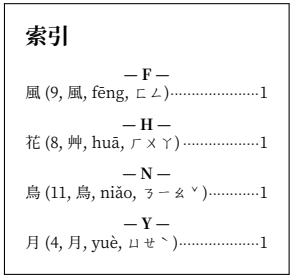
```
\centerline{\bfseries --- 四畫 ---}\par\nobreak
  \item 月 (4, 月, yuè, ㄩㄝˋ)\leaders\hbox{ }\hfill 1

  \indexspace

\centerline{\bfseries --- 八畫 ---}\par\nobreak
  \item 花 (8, 艸, huā, ㄏㄨㄚ)\leaders\hbox{ }\hfill 1
```

Zhuyin (Bopomofo) Sort Order 注音符號 zh-u-co-zhuyin

```
\centerline{\bfseries --- ㄈ ---}\par\nobreak
  \item 風 (9, 風, fēng, ㄈㄥ)\leaders\hbox{ }\hfill 1

  \indexspace

\centerline{\bfseries --- ㄋ ---}\par\nobreak
  \item 鳥 (11, 鳥, niǎo, ㄋㄧㄠˇ)\leaders\hbox{ }\hfill
```

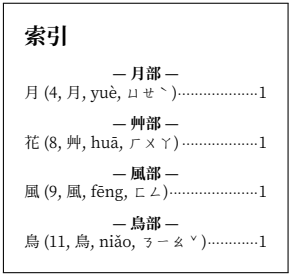
upmendex Output *.ind

Chinese, Han Ideograph Sort Order



拼音
pinyin

筆畫數
stroke



部首筆畫數
radical-stroke

注音符號
zhuyin (bopomofo)

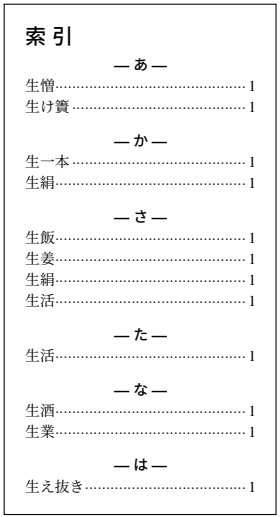
Japanese, Sort by Reading (Yomi)

Japanese Inputs with Reading (Yomi) in *.tex

```
\newcommand{\YomiTag}[1]{\relax}

%%  \index{reading@index_word}
生酒\index{なまざけ@生酒}。
生一本\index{きいっぽん@生一本}。
生け簀\index{いけす@生け簀}。
生絹\index{きぎぬ@生絹\YomiTag{きぎぬ}}%
    \index{すずし@生絹\YomiTag{すずし}}。
生飯\index{さば@生飯}。
生姜\index{しょうが@生姜}。
生活\index{せいかつ@生活\YomiTag{せいかつ}}
    \index{たつき@生活\YomiTag{たつき}}。
...
```

Japanese words consist of Hanzi (ideographs) & Kana (syllabaries), sorted by reading (yomi), indexed by Kana.

This feature is implemented by **ASCII mendex**.



索 引

— あ —

生憎 1
生け簀 1

— か —

生一本 1
生絹 1

— さ —

生飯 1
生姜 1
生絹 1
生活 1

— た —

生活 1

— な —

生酒 1
生業 1

— は —

生え抜き 1

Japanese, Reading & Dictionary

Japanese Inputs in *.tex

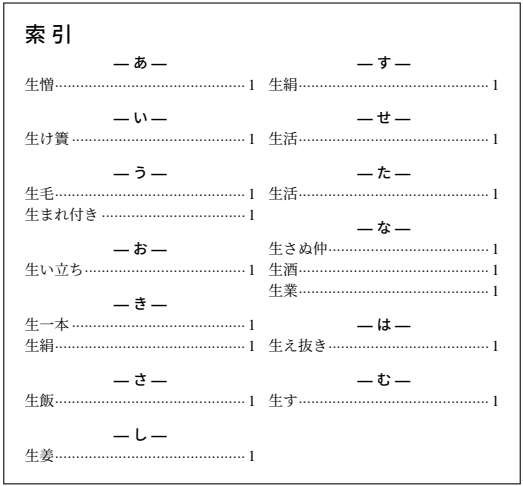
```
生酒\index{生酒}。
生一本\index{生一本}。
生け簀\index{生け簀}。
生絹\index{生絹}%
    \index{すずし@生絹\YomiTag{すずし}}。
生え抜き\index{生え抜き}。
...
```

Dictionary *.dic

index_word	reading
生酒	なまざけ
生一本	きいっぽん
生け簀	いけす
生絹	きぎぬ
生え抜き	はえぬき

...

Implemented by **ASCII mendex**.



索 引

— あ —
生憎 1

— い —
生け簀 1

— う —
生毛 1
生まれ付き 1

— お —
生い立ち 1

— き —
生一本 1
生絹 1

— さ —
生飯 1

— し —
生姜 1

— す —
生絹 1

— せ —
生活 1

— た —
生活 1

— な —
生さぬ仲 1
生酒 1
生業 1

— は —
生え抜き 1

— む —
生す 1

Japanese, Hentaigana

Inputs with Hentaigana in *.tex

```
きそば\index{きそば}
うなぎ\index{うなぎ}
しるこ\index{しるこ}
すし\index{すし}
天ぷら\index{天ぷら}
...
```

Dictionary for Hentaigana *.dic

index_word	reading
き	き
そ	そ
は	は
な	な
し	し
こ	こ
...	

お品書き

— う —

うどん 1
うどん 1
うなぎ 1
うなぎ 1

— き —

きそば 1
きそば 1

— し —

しるこ 1
しるこ 1

— す —

すし 1
すし 1

— せ —

せんべい 1
せんべい 1

— た —

だんご 1
だんご 1

— て —

てんぷら 1
天ぷら 1

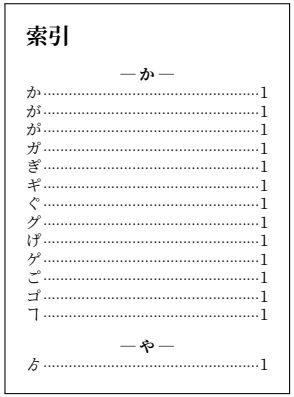
Extended Kana in JIS X 0213

Extended Kana Inputs in *.tex

```
ゕ\index{ゕ}. % NGA
ゖ\index{ゖ}. % NGI
ゟ\index{ゟ}. % NGU
...
𛀁\index{𛀁}. % Hiragana Digraph Yori
𛀾\index{𛀾}. % Katakana Digraph Koto
```

Aynu itak Inputs in *.tex

```
ク\index{ク}
シ\index{シ}
ス\index{ス}
プ\index{プ}
ゼ\index{ゼ}
ヅ\index{ヅ}
ド\index{ド}
...
```

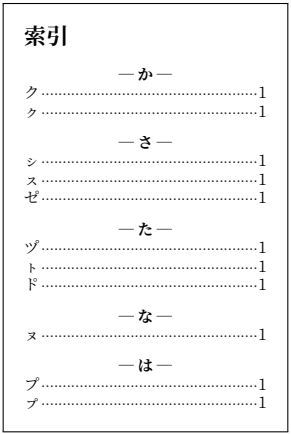

索引

— か —

か……1
が……1
が……1
ガ……1
ぎ……1
ギ……1
ぐ……1
グ……1
げ……1
ゲ……1
ご……1
ゴ……1
ヿ……1

— や —

𛀁……1


索引

— か —

ク……1
ク……1

— さ —

シ……1
ス……1
ゼ……1

— た —

ヅ……1
ト……1
ド……1

— な —

ヌ……1

— は —

プ……1
プ……1

Japanese, Archaic Kana

Katakana “YE” =「ヱ」???
“WE” ≠ 「ヱ」???

Japanese, Archaic Kana

Katakana “YE” =「ヱ」???
“WE” ≠ 「ヱ」???

Katakana Letter Archaic YE =「ㇱ」
defined in Unicode 14.0 (2021)

Ref. http://www.unicode.org/L2/L2019/19381-missing-kana.pdf
https://dl.ndl.go.jp/info:ndljp/pid/993592

Japanese, Archaic Kana

Archaic Kana Inputs in *.tex

```
ゟ\index{ゟ}. % Hiragana Archaic YE
              %  or Hentaigana E-1
ゑ\index{ゑ}. % Hiragana WU
ヿ\index{ヿ}. % Katakana YI
ㇱ\index{ㇱ}. % Katakana YE
ㇳ\index{ㇳ}. % Katakana WU
...
```

Dictionary: “ゟ” is Hentaigana E-1

ゟ　　え

Style: “ゟ” is Hiragana Archaic YE

icu_rules "&ゆ<ゟ<<<ㇱ<よ"

索引

— エ —

え 1
エ 1
ゟ (Hentaigana E-1) 1

— ヤ —

ヤ 1

— レ —

レ 1

— ユ —

ユ 1

— ㇱ —

ㇱ 1

— ヨ —

ヨ 1

— ㇳ —

ゑ 1
ㇳ 1

索引

— エ —

え 1
エ 1

— ヤ —

ヤ 1

— レ —

レ 1

— ユ —

ユ 1

— ㇱ —

ㇱ 1
ゟ (Archaic YE) 1

— ヨ —

ヨ 1

— ㇳ —

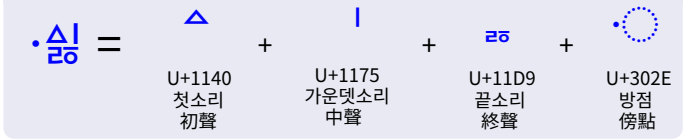
ゑ 1
ㇳ 1

Korean, Modarn / Archaic Hangul

ideograph
한자
日

modarn
현대 한글
일
U+C77C

archaic, composed / decomposed
옛 한글, 완성형 / 조합형 (完成型 / 組合型)



	Unicode block	style		upmendex	upLaTeX	XeLaTeX
modarn	Hangul Syllables	composed	완성형	✓	✓	✓
ex. 일	Hangul Jamo	decompopsed	조합형	✓	N.A.	✓
archaic	Private Use Area	composed	완성형	via dictionary	✓	✓
ex. ·싫	Hangul Jamo	decomposed	조합형	✓	N.A.	✓

Korean Hangul

Hangul Inputs in *.tex

```
쓰\index{쓰 (composed)}.
쓰\index{쓰 (decomposed)}.

ᄊ ᆞ\index{ᄊ ᆞ (archaic)}.
ᄊ ᆞ ᄉ\index{ᄊ ᆞ ᄉ (archaic with tone mark)}.
ᄊᆞ\index{ᄊᆞ (Hanyang PUA)}.
...
```

Dictionary for PUA code *.dic

```
Hanyang PUA code    decomposed
ᄊᆞ                  ᄊ ᆞ
씨                  ᄊ ᅵ
...
```

찾아보기

ㅡ ᄉ ㅡ

스 (composed) 1
ᄉ (archaic) 1

ㅡ ᄊ ㅡ

쓰 (composed) 1
쓰 (decomposed) 1
ᄊᆞ (archaic with tone mark) 1
ᄊᆞ (archaic) 1
ᄊᆞ (Hanyang PUA) 1

ㅡ ᄽ ㅡ

ᄽ (archaic) 1
ᄽ (Hanyang PUA) 1

ㅡ ᄾ ㅡ

ᄾ (archaic) 1

ㅡ ᄿ ㅡ

ᄿ (archaic) 1

ㅡ ᅀ ㅡ

ᅀ (archaic) 1

Complex Text Layout

- Devanagari, Thai
- Arabic, Hebrew: R-to-L typeset
- Symbol, Number

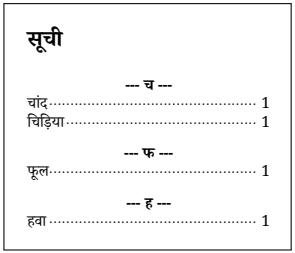
Devanagari & Thai (experimental)

Hindi Inputs in *.tex

फूल \index{ फूल }
चिड़िया \index{ चिड़िया }
हवा \index{ हवा }
चांद \index{ चांद }
...

Thai Inputs in *.tex

ดอกไม้ \index{ ดอกไม้ }
นก \index{ นก }
ลม \index{ ลม }
ดวงจันทร์ \index{ ดวงจันทร์ }
...



Hindi, Devanagari

Thai

Typeset by XeLaTeX

Arabic & Hebrew (experimental)

Arabic Inputs in *.tex

زهرة \index{زهرة}
عصفور \index{عصفور}
ريح \index{ريح}
القمر \index{القمر}
…

Hebrew Inputs in *.tex

פֶּרַח \index{פֶּרַח}
ציפור \index{ציפור}
רוּחַ \index{רוּחַ}
ירח \index{ירח}
…

Arabic

Hebrew

R-to-L typeset by XeLaTeX.
upmendex processes only indexing.

Symbol, Number

Script	charType	example	treatment by upmendex
Latin	Lu, Ll, Lo, ... : letters	ABCabcＡａⓐ	directly pass to ICU collator
Greek	Lu, Ll, Lo, ... : letters	ΑΒΓαβγ	direct
Cyrillic	Lu, Ll, Lo, ... : letters	АБВабв	direct
Kana	Lo : other letter	あいうアｱ㋐㌀	direct
Hangul	Lo : other letter	가나다ﾡ㉡㉰㉾	direct
Hanzi	Lo : other letter	花鳥風月	lookup dictionary or direct
—	Lm : modifier letter	ー゛゜ｰ	direct
Number	Nd : dicimal digit number	012０１２	direct
	No : other number	¹²③➍⑤❻🄈⑻⒐	lookup dictionary or direct
Symbol	Sk : modifier symbol	¨ ¯ ´ ˆ ˋ ˝ ˚	direct
	Sm : math symbol	÷▷♯	lookup dictionary or direct
	So : other symbol	⛄☎♥⚽⚾	lookup dictionary or direct
	Sc : currency symbol	€$＄¢£¥￥₩￦	lookup dictionary or direct
	Po, Pd, Mn, Me, ... : other punctuation etc.	?!!?¡¿†#§¶—	direct
—	Cc : control character	ESC, BS, DEL	ignore
—	Cf : format character	BOM, RLM	dicect
others	Lo, etc. (unknown scripts)		lookup dic or direct (option “-f”) or ignore

Characters are classified by Unicode *General Category Values* or “charTypes”

Ref. https://unicode.org/reports/tr44/#General_Category_Values

Multilingual Environment with upLaTeX/pxbabel

Block Setting for Scripts in Style File *.ist

```
script_preamble   cyrillic "\n\\fontencoding{T2A}\\selectfont"
script_postamble  cyrillic "\n\\fontencoding{T1}\\selectfont"

script_preamble   hangul   "\n\\begin{otherlanguage}{korean}"
script_postamble  hangul   "\n\\end{otherlanguage}"

script_preamble   hanzi    "\n\\begin{otherlanguage}{tchinese}"
script_postamble  hanzi    "\n\\end{otherlanguage}"
```

upmendex Output *.ind

```
\centerline{\bfseries --- C ---}\par\nobreak
  \item София\leaders\hbox{~}\hfill 1
...
\fontencoding{T1}\selectfont

  \indexspace

\centerline{--- サ ---}\par\nobreak
  \item さいたま\leaders\hbox{~}\hfill {1}
  \item 札幌\leaders\hbox{~}\hfill {1}
...
\begin{otherlanguage}{korean}

  \indexspace

\centerline{\bfseries --- ㅂ ---}\par\nobreak
  \item 부산(釜山)\leaders\hbox{~}\hfill 1
...
\end{otherlanguage}
```

Multilingual Environment with XeLaTeX/polyglossia

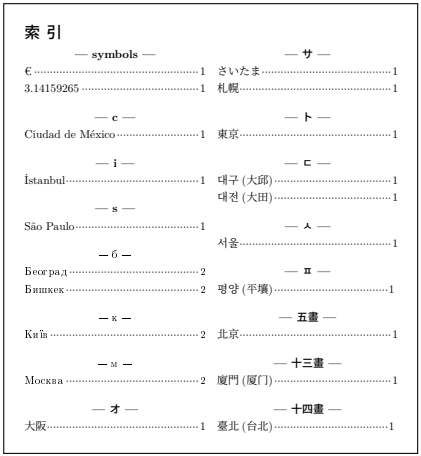
Block Setting for Scripts in Style File *.ist

```
script_preamble   cyrillic "\n\\begin{russian}"
script_postamble  cyrillic "\n\\end{russian}"

script_preamble   kana     "\n\\begin{japanese}"
script_postamble  kana     "\n\\end{japanese}"

script_preamble   hangul   "\n\n\\begin{korean}"
script_postamble  hangul   "\n\\end{korean}"

script_preamble   hebrew   "\n\\begin{hebrew}"
script_postamble  hebrew   "\n\\end{hebrew}"
```

upmendex Output *.ind

```
\centerline{--- さ ---}\par\nobreak
  \item さいたま\leaders\hbox{~}\hfill {1}
...
\end{japanese}

\begin{korean}

  \indexspace

\centerline{--- ㄷ ---}\par\nobreak
  \item 대구(大邱)\leaders\hbox{~}\hfill {1}
...
\end{korean}

\begin{hebrew}

  \indexspace

\centerline{--- א ---}\par\nobreak
  \item אשדוד\leaders\hbox{~}\hfill {2}
...
\end{hebrew}
```

Output of Multilingual Index



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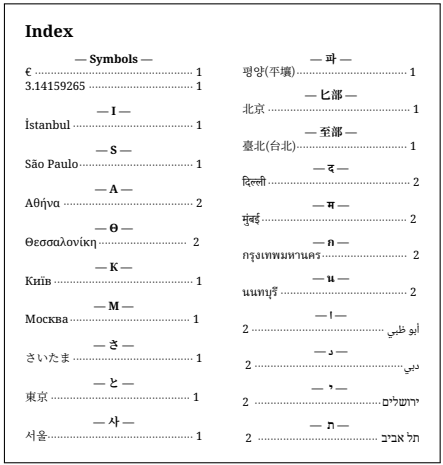
with upLaTeX & pxbabel



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with XeLaTeX & polyglossia

Benchmark

	makeindex	mendex	upmendex	xindy
internal encoding Collator	8bit 1byte locale	EUC-JP ASCII, Kana	UTF-16 ICU collator	Unicode
Latin	✓	✓ ASCII	Lang:37, Locale:62	Lang:32
Greek			Lang:1, Locale:1	Lang:1
Cyrillic			Lang:9, Locale:9	Lang:6
Chinese			Lang:1, Locale:4	
Japanese		✓ (Yomi, Dict)	✓ (Yomi, Dict) Lang:1, Locale:2	
Korean			Lang:1, Locale:3	
Devanagari			Lang:3, Locale:3	
Thai			Lang:1, Locale:1	
Arabic			Lang:6, Locale:7	
Hebrew			Lang:2, Locale:3	Lang:1
Other				Lang:4
Total		Lang:2	Lang:60, Locale:95	Lang:44

Languages by Number of Native Speakers

	Language	Script	speakers	ICU	polyglossia	upmendex	xindy
1	Chinese	Hanzi	1,370,000,000	✓		✓	
2	Engish	Latin	530,000,000	✓	✓	✓	✓
3	Hindi	Devanagari	490,000,000	✓	✓	✓	
4	Spanish	Latin	420,000,000	✓	✓	✓	✓
5	Arabic	Arabic	230,000,000	✓	✓	✓	
6	Bengali	Bengali	220,000,000	✓	✓		
7	Portuguese	Latin	215,000,000	✓	✓	✓	✓
8	Russian	Cyrillic	180,000,000	✓	✓	✓	✓
9	Japanese	Kana & Hanzi	134,000,000	✓	✓	✓	
10	German	Latin	130,000,000	✓	✓	✓	✓
11	French	Latin	123,000,000	✓	✓	✓	✓
12	Punjabi	Gurmukhi	90,000,000	✓			
13	Javanese	Latin	75,000,000	✓	✓	✓	
14	Korean	Hangul	75,000,000	✓	✓	✓	
15	Vietnamese	Latin	70,000,000	✓	✓	✓	✓
16	Telugu	Telugu	70,000,000	✓	✓		
17	Marathi	Devanagari	68,000,000	✓	✓	✓	
18	Tamil	Tamil	74,000,000	✓	✓		
19	Persian	Arabic	46,000,000	✓	✓	✓	
20	Urdu	Arabic	61,000,000	✓	✓	✓	

Ref. https://ja.wikipedia.org/wiki/ネイティブスピーカーの数が多い言語の一覧

Languages used on the Internet

	Language	share	Script	ICU	pg	upm	xnd
1	English	63.4 %	Latin	root	✓	✓	✓
2	Russian	7.1 %	Cyrillic	ru	✓	✓	✓
3	Spanish	3.9 %	Latin	es	✓	✓	✓
4	German	3.7 %	Latin	de	✓	✓	✓
5	Turkish	3.5 %	Latin	tr	✓	✓	✓
6	Persian	2.5 %	Arabic	fa	✓	✓	
7	French	2.0 %	Latin	root	✓	✓	✓
8	Japanese	1.9 %	Kana	ja	✓	✓	
9	Portuguese	1.8 %	Latin	pt	✓	✓	✓
10	Chinese	1.3 %	Hanzi	zh		✓	
11	Vietnamese	1.3 %	Latin	vi	✓	✓	✓
12	Italian	1.0 %	Latin	root	✓	✓	✓
13	Arabic	0.9 %	Arabic	ar	✓	✓	
14	Polish	0.9 %	Latin	pl	✓	✓	✓
15	Greek	0.7 %	Greek	el	✓	✓	✓
16	Dutch	0.7 %	Latin	nl	✓	✓	✓
17	Indonesian	0.7 %	Latin	root	✓	✓	
18	Korean	0.6 %	Hangul	ko	✓	✓	
19	Czech	0.4 %	Latin	cs	✓	✓	✓
20	Thai	0.4 %	Thai	th	✓	✓	

	Language	share	Script	ICU	pg	upm	xnd
21	Ukrainian	0.3 %	Cyrillic	uk	✓	✓	✓
22	Hebrew	0.3 %	Hebrew	he	✓	✓	✓
23	Swedish	0.3 %	Latin	sv	✓	✓	✓
24	Romanian	0.3 %	Latin	ro	✓	✓	✓
25	Hungarian	0.3 %	Latin	hu	✓	✓	✓
26	Danish	0.2 %	Latin	da	✓	✓	✓
27	Slovak	0.2 %	Latin	sk	✓	✓	✓
28	Serbian	0.2 %	Latn, Cyrl	sr	✓	✓	✓
29	Bulgarian	0.1 %	Cyrillic	bg	✓	✓	✓
30	Finnish	0.1 %	Latin	fi	✓	✓	✓
31	Croatian	0.1 %	Latin	hr	✓	✓	✓
32	Lithuanian	0.1 %	Latin	lt	✓	✓	✓
33	Norwegian (Bokmål)	0.1 %	Latin	nb	✓	✓	✓
34	Hindi	0.1 %	Devanagari	hi	✓	✓	
35	Norwegian (nynorsk)	0.1 %	Latin	nn	✓	✓	✓
36	Slovenian	0.1 %	Latin	sl	✓	✓	✓
37	Latvian	0.1 %	Latin	lv	✓	✓	✓
38	Estonian	0.1 %	Latin	et	✓	✓	✓
39	Azerbaijani	< 0.1 %	Latin	az		✓	
40	Catalan	< 0.1 %	Latin	root	✓	✓	

Ref. https://ja.wikipedia.org/wiki/インターネットにおける言語の使用

To Do

- Support more scripts
  - Bengali, Telugu, Tamil, Malayalam, Kannada, Gujarati, Oriya, Sinhala
  - Khmer, Lao, Myanmar (Burmese)
  - Tibetan, Mongolian
  - Armenian, Georgian
  - Ethiopic (Amharic)
  - etc.
- Support more locales
  - Latin Script: Sorbian, Hausa, Igbo, Yoruba, Kalaallisut, Breton, Uzbek
  - etc.
- Add style options
  - `script_head`

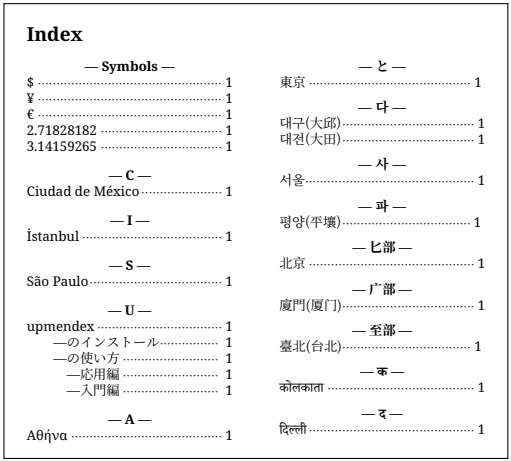
Feedback is welcome

https://github.com/t-tk/upmendex-package/issues

Summary

I introduced multilingual index processor **upmendex**.

- Feature
- Localization: 60 Languages, 12 Scripts
  - Latin, Cyrillic, Greek
  - CJK (Chinese, Japanese, Korean)
  - Devanagari, Thai, Arabic, Hebrew
  - Symbol, Number
- Multilingualization
  - Environment for upLaTeX/babel & XeLaTeX/polyglossia



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References

1. ASCII Nihongo TeX (Publishing TeX), ASCII MEDIA WORKS (web site by DWANGO Co., Ltd.). The site distributes mendexk source files.
2. Source/Document distribution of upmendex — multilingual index processor @ GitHub. upmendex @ CTAN
3. upTeX, upLaTeX — unicode version of pTeX, pLaTeX
4. International Components for Unicode (ICU)
5. PXbase — LaTeX: Support library for other PX packages @ GitHub. The repository distributes pxbabel.
   pxbase @ CTAN
6. polyglossia — An alternative to Babel for XeLaTeX and LuaLaTeX @ GitHub.
   polyglossia @ CTAN
7. “Indexing Makes Your Book Perfect” by SHIKANO Keiichiro at TUG2013, October, Tokyo.